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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LE, DUY K	

ART UNIT	PAPER NUMBER
2685	5

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/811,879	JAGIELSKI ET AL.	
	Examiner	Art Unit	
	Duy K Le	2685	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-10 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-10 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in EPO on 03/18/2000. It is noted, however, that applicant has not filed a certified copy of the 00 105 812.2 application as required by 35 U.S.C. 119(b).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,862,458 to Ishii in view of Chao-Cheng (U.S. Patent 5,991,643).

As to claim 1, Figure 1 in Ishii shows a radio station for transmitting signals (see also Col. 3, line 32 to Col. 4, line 7), the radio station comprising:

a modulator (1) modulating a signal to be transmitted;

a power amplifier (2) connected to said modulator for amplifying the modulated signal and producing an output power and a test signal;

a summing device (5) connected to said power amplifier for subtracting the test signal of the power amplifier from a reference signal to generate a control signal;

an antenna (3) for transmitting and receiving the signals;

an impedance (8) with a variable reactance being switched between said antenna and said power amplifier.

However, the Ishii reference does not expressly disclose an analog to digital converter converting the control signal to a digital signal; and a processor using the digital signal to change said variable reactance of said impedance. The Chao-Cheng reference teaches an analog to digital converter converting the control signal to a digital signal; and a processor using the digital signal to change said variable reactance of said impedance ("a transceiver circuit 40 electrically connected to the impedance matching circuit 32 for converting radio signals received by the antennas into base band signals for the processor 42 and converting the base band signals to be transmitted from the processor 42 into radio signals, a memory 44 for storing programs and data, a processor 42 for executing programs stored in the memory 44 to control operations of the radio transceiver 10, and a mode control circuit 34 for controlling each antenna switch and the impedance matching circuit 32 according to the ten control modes shown in FIG. 3" (Col. 2, lines 23-33). "The mode control program 36 and mode control circuit 34 can be treated as a mode control means which controls the four antenna switches S0-S3 and the impedance matching circuit 32" (Col. 2, lines 55-58). See also Figure 2. As interpreted by examiner, the transceiver circuit 40 is functionally equivalent to an analog to digital converter, outputting digital signals to the processor).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the radio station of Ishii to comprise an analog to digital converter converting the control signal to a digital signal; and a processor using the digital signal to change said variable reactance of said impedance, as taught by Chao-Cheng, in order to change and select a best control mode to achieve the best communication quality.

As to claim 2, Ishii-Chao-Cheng discloses the radio station according to claim 1, wherein said processor calculates an optimum value for the variable reactance of said impedance according to the digital signal (Chao-Cheng; "when selecting a best control mode to achieve the highest communication efficiency, the mode control program 36 changes the control mode of the mode control circuit 34 one by one, records the signal strength of each control mode detected by the RSSI program 46, selects a best control mode according to a predetermined selection criteria" (Col. 3, lines 2-8)).

As to claim 3, Ishii-Chao-Cheng discloses the radio station according to claim 2, wherein said processor includes a table storing the optimum value for the variable reactance of said impedance for the digital signal and relating the stored optimum value to the respective digital signal and a respective output power of said power amplifier (Chao-Cheng; "in another embodiment, the antenna switches S0, S1, S2, S3 and resistor switches S4, S5, S6, S7 can be directly controlled by the processor 42, and thus the mode control circuit 34 can be eliminated. In this case the mode control table 50 shown in FIG. 3 can be stored in the memory 44 and the mode control program 36 can directly control the antenna and resistor switches according to the control modes of the mode control table 50" (Col. 3, lines 31-38)).

As to claim 4, Ishii-Chao-Cheng discloses the radio station according to claim 3, wherein said processor compares the digital signal with stored values of the digital signal to determine the reactance of said impedance (Chao-Cheng; ""when selecting a best control mode to achieve the highest communication efficiency, the mode control program 36 changes the control mode of the mode control circuit 34 one by one, records the signal strength of each control mode detected by the RSSI program 46, selects a best control mode according to a predetermined selection

criteria" (Col. 3, lines 2-8). "The mode control circuit 34 in FIG.2 is used for controlling each antenna switch and the impedance matching circuit 32. When a proper control mode has been selected, the mode control program 36 will pass the mode number of the control mode in FIG. 3 to the mode control circuit 34. The mode control circuit 34 will immediately switch on or off the corresponding antenna and resistor switches according to the received mode number" (Col. 3, lines 24-31)).

As to claim 5, Ishii-Chao-Cheng discloses the radio station according to claim 2. The Ishii reference (Figure 1) further discloses: a directional coupler (5) transferring a first part of the output power of said power amplifier as the test signal; a power detector (4) connected to said directional coupler and said summing device and receiving the first part of the output power, said power detector converting the first part of the output power of the power amplifier to a voltage; said summing device (7) subtracting the voltage from a reference voltage to generate a difference voltage; and an integrator (7) connected to said summing device, receiving the difference voltage, and integrating the difference voltage to generate the control signal and the power amplifier generating an output power according to the control signal (see Col. 3, line 32 to Col. 4, line 7).

As to claim 6, Ishii-Chao-Cheng discloses the radio station according to claim 1, wherein said summing device (7) subtracts a supply current of said power amplifier from a reference current to generate a difference current; and an integrator (7) is connected to said power amplifier for integrating the difference current to generate the control signal (see Col. 3, lines 54-64); and said power amplifier (2) generates the output power according to the control signal (see Col. 6, lines 9-19)).

As to claim 7, Ishii-Chao-Cheng discloses the radio station according to claim 1. The Ishii reference discloses the power amplifier has a gain ("as a result, the power amplifying circuit 2 can no longer power-amplify the modulation signal within the linear region. Accordingly, since the power amplifying circuit 2 power-amplifies the modulation signal in the non-linear region, the spurious component is produced in the signal from the power amplifying circuit 2, so that the signal would be distorted" (Col. 5, lines 27-33)), and an impedance converting circuit adjusts the gain of said power amplifier and the variable reactance of the impedance according to the control signal (see Col. 6, lines 9-19). However, it does not disclose an analog-digital converter converts a test voltage as the control signal of the power amplifier into the digital signal, and a processor adjusts the gain of said power amplifier and the variable reactance of the impedance according to the control signal.

The Chao-Cheng reference teaches an analog-digital converter converts a test voltage as the control signal of the power amplifier into the digital signal, and a processor adjusts the gain of said power amplifier and the variable reactance of the impedance according to the control signal ("a transceiver circuit 40 electrically connected to the impedance matching circuit 32 for converting radio signals received by the antennas into base band signals for the processor 42 and converting the base band signals to be transmitted from the processor 42 into radio signals, a memory 44 for storing programs and data, a processor 42 for executing programs stored in the memory 44 to control operations of the radio transceiver 10, and a mode control circuit 34 for controlling each antenna switch and the impedance matching circuit 32 according to the ten control modes shown in FIG. 3" (Col. 2, lines 23-33). "The mode control program 36 and mode control circuit 34 can be treated as a mode control means which controls the four antenna

switches S0-S3 and the impedance matching circuit 32" (Col. 2, lines 55-58). See also Figure 2. As interpreted by examiner, the transceiver circuit 40 is functionally equivalent to an analog to digital converter, outputting digital signals to the processor).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the radio station of Ishii wherein an analog-digital converter converts a test voltage as the control signal of the power amplifier into the digital signal, and a processor adjusts the gain of said power amplifier and the variable reactance of the impedance according to the control signal, as taught by Chao-Cheng, in order to achieve the highest transmitting efficiency.

As to claim 9, Ishii-Chao-Cheng discloses the radio station according to claim 5. The Ishii reference (Figure 2) further discloses said impedance includes a capacitor, an inductor, and a signal processing unit for changing a capacitance of said capacitor and an inductance of said inductor by applying signals to said capacitor and said inductor ("in such an impedance converting circuit 8, since the variable capacitance diode 83 is constructed of, e.g., a varicap, the capacitance is varied in response to the voltage value of the control signal" (Col. 4, lines 14-17)).

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,862,458 to Ishii in view of Chao-Cheng (U.S. Patent 5,991,643) and further in view of Flaxl (U.S. Patent 5,491,715).

As to claim 8, Ishii-Chao-Cheng discloses the radio station according to claim 5. Chao-Cheng further discloses a signal processing unit operating the switches according to a signal from said processor ("the mode control circuit 34 in FIG.2 is used for controlling each antenna switch and the impedance matching circuit 32. When a proper control mode has been selected,

the mode control program 36 will pass the mode number of the control mode in FIG. 3 to the mode control circuit 34. The mode control circuit 34 will immediately switch on or off the corresponding antenna and resistor switches according to the received mode number" (Col. 3, lines 24-31)). However, Ishii-Chao-Cheng does not disclose the impedance includes a plurality of capacitors switched together in parallel connected by switches of a plurality of conductors switched together in parallel. The Flaxl reference teaches the impedance includes a plurality of capacitors switched together in parallel connected by switches of a plurality of conductors switched together in parallel (see Figure 8 and Col. 6, lines 35-51).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the radio station of Ishii-Chao-Cheng wherein the impedance includes a plurality of capacitors switched together in parallel connected by switches of a plurality of conductors switched together in parallel, as taught by Flaxl, in order to implement a tuning circuit to reduce phase difference in signals.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,862,458 to Ishii in view of Chao-Cheng (U.S. Patent 5,991,643) and further in view of Kitchener (U.S. Patent 6,018,324).

As to claim 10, Ishii-Chao-Cheng discloses the radio station according to claim 5. The Chao-Cheng reference further discloses "the impedance matching circuit 32 comprises four resistors X0, X1, X2, X3 and four resistor switches S4, S5, S6, S7 connected to the four resistors X0, X1, X2, X3 respectively. The four resistors X0, X1, X2, X3 are connected in parallel and the resistance of the four resistors are designed to match the four antennas 14, 15, 16, 17. The resistor switches S4, S5, S6, S7 are controlled by the mode control circuit 34 so that the

impedance of the impedance matching circuit 32 can match the impedance of the connected antennas 14, 15, 16, 17" (Col. 2, lines 36-45). However, Ishii-Chao-Cheng does not expressly disclose the use of microstrip lines for the impedance matching circuit and thus does not disclose the impedance includes a plurality of microstrip lines switched together in parallel and a signal processing unit sending signals placed between said microstrip lines according to a signal of said processor. The Kitchener reference teaches use and implementation of microstrip impedance matching circuit and thus teaches the impedance includes a plurality of microstrip lines switched together in parallel and a signal processing unit sending signals placed between said microstrip lines according to a signal of said processor ("the matching network can be incorporated as an integral part of the structure in the microstrip feed track. In FIG. 5 it can be seen that a quarter wavelength microstrip impedance transformer has been used" (Col. 5, line 66 to Col. 6, line 2). "More complex matching networks can be implemented, microstrip stubs can be used for adding parallel inductance or capacitance" (Col. 6, lines 5-8)).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the radio station of Ishii-Chao-Cheng wherein the impedance includes a plurality of microstrip lines switched together in parallel and a signal processing unit sending signals placed between said microstrip lines according to a signal of said processor, as taught by Kitchener, in order to implement a matching network of compact dimensions.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Yajima (U.S. Patent Application Publication 2001/0044283 A1) discloses radio apparatus and method having a D.C. component signal superposed on a transmission signal.

b. Finnell et al. (U.S. Patent 6,625,428) discloses voltage standing-wave ratio measurement apparatus and use in a cellular communications system.

c. Chadwick et al. (U.S. Patent 6,005,891) discloses system for testing signal transmission/reception apparatus.

d. Horowitz et al. (U.S. Patent 5,722,056) discloses radio transmitter with power amplifier linearizer.

e. Meier et al. (U.S. Patent 5,450,088) discloses transponder arrangement.

f. Jacobs et al. (U.S. Patent 3,662,294) discloses microstrip impedance matching circuit with harmonic terminations.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duy K Le whose telephone number is 703-305-5660. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward F Urban can be reached on 703-305-4385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Duy Le
February 18, 2004

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